

Zero Retries 0248 - 2026-04-24

2026-04-24 - MeshCore Split, TPRFN Update, zBitx v2, iShareRadio Remote Radio Sharing Service, Pebble HF QRP HF Radio Kit, VARAtrack, Graywolf, Stix Radio, QRX for APRS, MegaPeater, Echo App

Steve Stroh N8GNJ

Zero Retries is an independent newsletter promoting technological innovation in and adjacent to Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Radios are computers - with antennas! Now in its fifth year of publication, with 3500+ subscribers.

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Substack says this issue is **too big for email clients**. Thus, it might be easier to read in a web browser - <https://www.zeroretries.org/p/zero-retries-0248>.

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I-Frame

By Steve Stroh N8GNJ

Brief notes about this issue of Zero Retries.

Paid Subscribers / Founding Members Update

My thanks to **Prefers to Remain Anonymous 69** for *renewing* as an **Annual Paid Subscriber** to Zero Retries this past week!

My thanks to **Joe Pistritto N3CKF** for becoming a *new* **Annual Paid Subscriber** to Zero Retries this past week!

Financial support from Zero Retries readers is a significant vote of support for the continued publication of Zero Retries.

Zero Retries Digital Conference 2026

ZRDC 2026

Zero Retries
Digital Conference

October 16, 2026
San Ramon, CA

www.zeroretries.org/p/conference



Shown above is our brand new ZRDC 2026 Poster!

This will be a regular reminder that Zero Retries Digital Conference 2026 will be held on Friday October 16, 2026 in San Ramon, California, USA. This is the first day of [Pacificon 2026](#) also in San Ramon. For more information, see www.zeroretries.org/p/conference.

Please direct comments / feedback about I-Frame to the [Zero Retries email list with the #ZR0248 hashtag](#).

Breaking - Major Split in Development of MeshCore

By Steve Stroh N8GNJ

I have no significant expertise to offer on this development in MeshCore, other than this is a regular occurrence in Open Source projects, and also in Amateur Radio.

This philosophical divide - human-generated software versus using artificial intelligence to develop software is now occurring in all elements of software development. There are passionate, well-informed, well-reasoned advocates on both sides. Including, of course, Amateur Radio - see another story about AI assisted software development later in this issue.

Meshcore.io blog - [Meshcore.io - Why The Split?](#)

Since inception, the MeshCore development team have been working hard to build MeshCore.

We've released more than 85 versions of the MeshCore Companion, Repeater and Room Server firmwares with support for more than 75 hardware variants. All of this has been hand crafted, by humans.

We have always been wary of AI generated code, but felt everyone is free to do what they want and experiment, etc. But, one of our own, Andy Kirby, decided to branch out and extensively use Claude Code, and has decided to aggressively take over all of the components of the MeshCore ecosystem: standalone devices, mobile app, web flasher and web config tools.

And, he's kept that *small* detail a secret - that it's all majority *vibe coded*.

...

The team didn't feel it was our place to protest, until we recently discovered that Andy applied for the MeshCore Trademark (on the 29th March, according to filings) and didn't tell any of us. We have tried discussing this, and what his intentions are, but those broke down and we now have no communication with Andy.

It's been a stressful few months trying to sort this out, and is now a sad day to bring this out to the public. It's been a slap in the face to the team that have worked so hard on this project, to have an insider team up with a robot and a lawyer.

"Official" MeshCore

The use of the 'official' status is what is currently being contested. Andy is adamant that he *owns* the brand, and is using the word very heavily with his MeshOS line.

Meanwhile, in reality, the only 'official' MeshCore is the github repo. It's the *source of truth* in terms of what is MeshCore, and Andy has *never* contributed to that.

Since the internal split, we launched the meshcore.io site, as Andy controls the meshcore.co.uk site and original discord server. We've been left with little other recourse. And, since launching the site, Andy copied the look and feel (again, using Claude) even though we asked him not to.

Project Growth

The MeshCore project has been on an incredible journey.

Having only started in January 2025, we have grown extremely fast!

As of this post, the official [MeshCore Map](#) shows 38,000+ nodes around the world, and the official [MeshCore App](#) has more than 100,000+ active users across Android and iOS.

It's pretty epic how we've all built such an incredible community in such a short time!

As the project grows, so does our need for a dedicated space that provides you with official information from the *core team*.

In recent times, we've seen an explosion of growth in MeshCore web sites dedicated to specific countries and mesh communities.

To name a few, we've seen:

- MeshCore Portugal over at <https://meshcore.pt>
- MeshCore Switzerland over at <https://meshcore.ch>
- and the first successes with MeshCore UK over at <https://meshcore.co.uk>

Andy Kirby did do an amazing job helping to promote the MeshCore project on his personal YouTube, but only promotes his own products now.

Where To From Here?

So, the core team are pushing ahead with the meshcore.io website, the ongoing work of firmware feature development, bug fixes, managing PR's and developer discussions, etc.

We now release change logs, blog posts and technical documentation for all of our new firmware and app releases here.

- <https://meshcore.io>
- <https://blog.meshcore.io>
- <https://docs.meshcore.io>

You'll also find some familiar faces on our blog posts, such as:

- **Scott** our project founder, lead firmware engineer and developer of the Ripple firmware!
- **Recrof** our official MeshCore Map developer and Firmware Flasher guru. He has shared some insights into the early development of the MeshCore Map.
- **Liam Cottle** the official MeshCore App developer who will be posting useful guides for getting started with the MeshCore App.

- **FDLamotte** who has done epic work on the Python tooling for MeshCore, as well as the STM32 firmware variants.
- **Oltaco** (Che Aporeps) who has done amazing work on the new OTA Fix bootloader that makes firmware updates much more reliable.

The Core Team

The MeshCore team, now consisting of **Scott, Liam, Recrof, FDLamotte** and now **Oltaco** remain committed to designing and developing high quality, *human-written* software.

Our New Home

Please update your bookmarks!

This is where we will be hosting all official releases, technical documentation, and community discussions moving forward.

With the new website, we are also starting fresh with a new Discord server!

This is where you can interact directly with the MeshCore developers, get help with your projects, and contribute to the future of MeshCore.

- Official Website: <https://meshcore.io>
- Latest Updates: <https://blog.meshcore.io>
- Technical Docs: <https://docs.meshcore.io>
- Official GitHub: <https://github.com/meshcore-dev/MeshCore>
- Reddit: <https://reddit.com/r/meshcore>
- Facebook: <https://facebook.com/groups/meshcore>
- Discord: <https://meshcore.gg>

Thanks for being a part of this journey!

The MeshCore Team

This... is going to be a slog.

It seems inevitable that the two MeshCore implementations - the development team, and Andy Kirby / meshcore.co.uk, having different agendas, are going to diverge and it seems inevitable to me that at some point soon they'll not be interoperable.

Both websites - <https://meshcore.io> and <https://meshcore.co.uk> are approachable for newcomers to MeshCore. They're appealing and engaging, with ample explanations for the various elements of MeshCore - software, hardware, and network. That there is so much in common between both sides, and both using the name MeshCore (and it being claimed as a MESHCORE™ on Kirby's site), the potential for confusion is huge.

Thus "*which* MeshCore are *you* using?" is going to become a frequent question of MeshCore users wanting to be able to communicate with their friends.

My thanks to Franco Venturi K4VZ for mentioning this on the Zero Retries email list for inclusion in Zero Retries.

Please direct comments / feedback about this article to the [Zero Retries email list with the #ZR0248 hashtag](#).

Brief Update on The Packet Radio Forwarding Network

By Glenn Allison N3MEL

Editor's Note - *I pinged N3MEL about an unrelated matter, and he responded with this great update on TPRFN, which he agreed to share with Zero Retries readers.*

We are approaching our fourth anniversary and now have 22 full-time stations on the air. We recently added stations in Nevada and Oregon. While they don't conform to the NVIS configuration to their east, we are seeing reliable West Coast traffic using 20m during the daytime. Establishing this [cross continent] RF path has been a long-term goal for us.

In other TPRFN news:

Winlink-to-Packet Gateway

I developed code allowing Winlink users to send private messages into the packet network. By addressing a message to WLGATE@WINLINK.ORG with the target packet station's call sign in the subject, users can send ASCII text or TPRFN forms. More details are available here: <https://www.tprfn.net/tprfn-gateway-news-1/winlink-to-packet-crossover>

Station Lookup

We launched a searchable packet station list with home BBS info: <https://www.tprfn.net/us-bbs-search-portal>

World Wide Conference Server

I will be sharing the code and setup details for the BPQ to WWnConference Server via AMPRnet to encourage better utilization of this feature.

Packet Forms

We have released Skywarn and NTS Radiogram generators specifically built for packet radio: <https://www.tprfn.net/html-to-text-packet-form>

Network Utilities

Thanks to Anthony K1JAD and Jay N8FLA, we now have a network health page and live hub stats: <https://www.tprfn.net/network-live-connections>

You can find more details at <http://tprfn.net>

Our current needs include:

1. **Network Promotion:** Increasing visibility wherever possible.
2. **Hub Stations:** Recruiting more full-time stations to fill gaps in the central United States.
3. **Advocacy:** Finding ways to return Packet Radio to the mainstream as a viable EmComm digital mode.

Editor's Note - *I clarified that despite "Packet Radio" being embedded into the name of the network, TPRFN is actually using various data modes, including VARA HF.*

Please direct comments / feedback about this article to the [Zero Retries email list with the #ZR0248 hashtag](#).

HF Signals zBitx v2 - Inexpensive Open Source HF Software Defined Radio

By Steve Stroh N8GNJ

As longer term Zero Retries readers know, I was enthusiastic about the zBitx low power portable HF radio when it was initially released in early 2025. Apparently too enthusiastic, it turns out as there were several issues with the original zBitx (now called v1) that damped my, and others, enthusiasm for that unit. But the cost of the zBitx v1 was relatively low. Thus I don't regret my "vote with my wallet" support for HF Signals and the zBitx, and I don't fault HF Signals for what turned out to be some issues with the initial version. They tried to develop an entry level portable SDR that was open source, and based on a popular microcomputer (rather than a microcontroller).

But small companies like HF signals listen to feedback from their customer base, and can iterate fast. The zBitx v2 is now available for \$269 including (international!) shipping.

As with zBitx v1, my enthusiasm for this product is that it is almost entirely a Software Defined Radio driven by a Raspberry Pi Zero 2 W. It's also open source, with a lot of future improvements to come from active community development. It amuses me that this particular radio is (claimed to be) running 64-bit [Linux](#) on a \$15 microcomputer.



HF Signals zBitx v2 - Image courtesy of HF Signals
 From the [HF Signals zBitx v2 website](http://www.hfsignals.com/zbitx-v2/):

What's new in v2

The zBitx v2 brings four major upgrades over the original zBitx:

- LDMOS-based, efficient 5 watt output.** The new LDMOS final amplifier delivers a clean, efficient 5 watts across all bands with lower current draw, cooler operation and longer battery life in the field.
- Built-in EFHW transformer.** Connect an End-Fed Half-Wave wire antenna directly to the radio — no external matching unit required. Just throw a wire into a tree and you're on the air.
- MOSFET-based reverse polarity protection built into the on/off switch. A MOSFET-based protection circuit is now integrated directly into the power switch, guarding the radio against reversed supply leads with effectively zero voltage drop.
- Responsive CW operation with macros and logging. The CW path has been reworked for crisp, low-latency keying with editable macros and integrated logging — the v2 is a serious CW machine, whether you're chasing DX or running a portable activation.

...

Built-in EFHW transformer

The zBitx v2 has an EFHW (End-Fed Half-Wave) transformer built directly into the radio. Connect a resonant half-wave wire to the antenna port and you are on the air — no external tuner, no separate matching box, no extra cables to pack. It's the ideal companion for pocket-portable, grab-and-go operations.

Reverse polarity protection, done right

A MOSFET-based reverse polarity protection circuit is built into the on/off switch. If you connect your power leads the wrong way around, the radio simply will not power up — and nothing inside gets damaged. Because it uses a MOSFET instead of a series diode, the voltage drop is negligible, so you get full output power and efficiency from every volt of your battery.

Everything is included:

Insert two 18650 LiPo batteries (not supplied) and you are ready to hit the field. At home, plug in a 9V power supply and work it from your monitor/keyboard/mouse. It has a built-in microphone and a high-quality speaker.

Remote into it with just the web-browser on your phone/tablet/laptop.

Specifications

Size: 170mm x 80mm x 45mm (including the battery case)

Weight: 415 grams including two LiPo batteries

Display: 480×320 resistive touch screen display with an independent Raspberry Pico front panel controller.

Software: Fully open sourced and available on <https://github.com/afarhan/zbitxv2>

Hardware: Hybrid superhet with LDMOS final amplifier, open source circuit with full description

Final Amplifier: LDMOS, efficient 5 watt output

Antenna Matching: Built-in EFHW transformer

Power Protection: MOSFET-based reverse polarity protection integrated into on/off switch

Frequency Coverage: All international ham bands from 80M to 10M

Power: 5 watts on all bands.

Power Supply: 6V to 9V.

Receive Current consumption: 300 mA

Transmit Current consumption: 1.5 to 3A (depending on the Drive settings)

Modes: USB/LSB/AM/CW/CW-Reverse/FT8/Digital modes (with FIDigi)

Preloaded Apps: FreeDV, QSSTV, Fldigi and more are coming

Another point of amusement about the zBitx v2 is that *it ships with [FreeDV](#)* digital voice mode for HF, though it's undoubtedly an older version of FreeDV which is probably now considered deprecated in favor of the much more capable [FreeDV RADE](#). The only other HF radios I'm aware of that ship with a digital voice mode are Icom HF radios with D-Star digital voice.

One criticism of the zBitx v1 was that some considered that all of the overhead of running the radio (display update, low latency for radio operation, processing voice and digital modes, and especially CW) was a bit too much for the Raspberry Pi Zero 2 W microcomputer, not to mention the “overhead” of running a full Linux stack. I think that this time, we'll have to wait for the verdict of customers of the zBitx v2 to see if the overall performance / responsiveness has been improved (enough).

I was impressed with two of the improvements that make the zBitx more usable and more forgiving of new user mistakes:

- Built-in EFHW transformer

- MOSFET-based reverse polarity protection

Those are the two most common mistakes of new users, especially with batteries / battery holders that allow batteries to be inserted backwards. The reverse battery protection system is elegant and seemingly goof-proof. If you do it wrong, it just doesn't start up, with no damage done.

The idea of attaching any random wire antenna and the radio just "handles it" with, again, seemingly goof-proof. (Obviously, optimizing the wire length, the better the performance).

Even though the display is a touch screen, you can also:

Remote into it with just the web-browser on your phone/tablet/laptop.

Lastly, for those of us that purchased zBitx v1 units, there is this procedure for updating to v2 software on the BITX20 email list by HF Signals founder Ashhar Farhan VU2ESE:

[Upgrading your zbitx \(v1\) to zbitx v2 software](#)

Note that this process is... apparently not bulletproof, so read the entire thread before attempting.

All in all, I really like the improvements in the zBitx v2 and I'll likely invest in one later in 2026 after I get a few more projects completed in N8GNJ / Zero Retries Labs.

My thanks to [DXR ELECTRONICS BITS](#) blog for mention of this development.

Please direct comments / feedback about this article to the [Zero Retries email list with the #ZR0248 hashtag](#).

iShareRadio Remote Radio Sharing Service

By Steve Stroh N8GNJ

iShareRadio is a new service that allows clubs and other organizations to share remote radios with granular permissions. Apparently it is still in development, but has been mentioned publicly by some of its principals.

I first learned about the [iShareRadio](#) service from listening to the [Ham Radio Workbench podcast](#), where it was discussed by host George Zafiropoulos KJ6VU.

The idea of using a remote radio station / system from anywhere, via Internet, isn't new. It's one of the primary benefits of the FlexRadio units, and recently implemented on the newest generation of HF radios from Elecraft, Icom, Kenwood, and Yaesu.

The idea of a "middleware" service to share remote radios amongst multiple users isn't new either - see [Remote Ham Radio \(RHR\)](#).

But until iShareRadio, there hasn't been a "middle ground" service suitable for clubs that want more flexibility than systems for individual access such as FlexRadio's SmartLink, and the approach of Remote Ham Radio of renting a "dream station" as a subscription service. Also a frustration with individual access systems is that they're unique to the radio manufacturer. To remotely use a FlexRadio requires the use of FlexRadio's SmartLink, and to remotely use an Icom radio, even at the same station, requires the use of Icom's remote access software.

Thus a service that's suitable for *clubs* to share one or more remote radios is the opportunity that was noticed by iShareRadio. There were several things that were mentioned by KJ6VU that were great features for clubs:

- Individual accounts, centrally administered. That ability to do centralized administration for a group is highly useful and needed. Didn't renew your club membership? You lose your access to the club's remote station.
- Scheduled access - An individual (club member) can reserve a radio for a specific time slot.
- Granular access - Features of the radio, or station, are granular enough that, for example, a club member with a Technician license can only use the radio on the bands that are compatible with their license class.
- Manages multiple types of radios in the same interface / system. If a remote station uses, for example, a FlexRadio FLEX-8400 for HF, and an Icom IC-9700 for VHF / UHF, both can be scheduled and managed by iShareRadio.

Remote Club Stations are More Feasible Than Ever

HF operation has become more problematic for many in the past decade. One primary complaint has been the steadily rising radio noise floor in the HF bands. In my opinion, this is an inevitable, and largely unstoppable result of the use of efficient switch mode power supplies that are used in everything from mobile phone chargers to microinverters on the back of solar panels (and very soon, the rise and inevitable ubiquity of "balcony solar" panels).

Another issue is the constraints of living arrangements of living in, or relocating to housing where external antennas are restricted such as condominiums, apartments, even senior living centers, and dorm rooms. For such situations, having access to a remote radio is an ideal solution.

A number of club hosted remote radio station situations come readily to mind:

- A "senior citizen community" that I saw in Florida, where individual Amateur Radio stations at the units were discouraged, but the community center building hosted an Amateur Radio station. Amateur Radio Operators in that community could share (one or more) radios at the club's Amateur Radio station, and could probably do so using a local microwave network such as AREDN.
- A college radio station where after hours access to the college Amateur Radio station is prohibited, but members of the club could remotely access the radio systems at the club station.
- Members of a large urban Amateur Radio club could demonstrate HF operation remotely to, for example, STEM classes, Makerspaces, and other gatherings without the inevitable difficulties of trying to make HF work in meetings.

But one of the most compelling ideas I've read about is the idea of finding a remote location where there is little or no electrical interference in the HF band to construct a remote radio station. Conceptually, such a remote radio station is "simple":

- 20 foot cargo container,
- Solar power and battery system (carefully chosen / engineered for low electrical noise, such as not using micro inverter solar panels),

- Starlink Internet Access
- Your choice of remotely controlled radios.

The “missing piece” for remote radio systems has been something like iShareRadio that is specifically designed for such situations as a hosted service that manages the complexities of granular sharing of remote radio stations, particularly the complexities of managing radios from different manufacturers.

While HF stations are the most well-known use of remote radio stations, there are many other uses of remote radio stations, especially the flexibility of a “cargo container” remote radio station that could be managed by iShareRadio:

- Amateur Radio satellite station that integrates the VHF / UHF radio with an automatic antenna tracking system,
- Earth Moon Earth (EME) station with a large antenna array,
- Beacon transmitters,
- Multiple Remote Receivers for multiple bands such as those used for HamSCI experiments,
- If the area is scenic (such as a long view of mountains), add a high definition video camera for the benefit of club members (some Starlink plans feature uncapped data transfer),
- If the area doesn't have any artificial light, add a star camera,
- Repeater / digipeater
- Aircraft ADS-B receiver,

The possibilities of such a remote radio station are endless. I imagine possibly locating such a station on some friend's properties in Montana and Wyoming.

Security Aspects of a Service Like iShareRadio

One issue of individual remote access is that consumer Internet access often is problematic. Sometimes such services require static IP addresses which can be expensive or unavailable from some Internet Service Providers. Sometimes individual TCP/IP ports must be (manually) opened for remote access to function. Other times it's impossible to “come back in” from the Internet (remote access) to a device that's connected via Carrier Grade Network Address Translation (CGNAT) such as what Starlink uses for IPv4.

There's also the administration issue(s) of the potential use of weak passwords, sharing of accounts to unauthorized users... all the headaches of any remote access system. Not to mention the ongoing issues of identifying security issues that need to be patched and distributed, updating application software, etc.

As much as I reflexively want to recommend [ARDC's 44Net Connect free VPN service for Amateur Radio Operators](#) to get access to a free static IPv4 address... 44Net Connect has its issues, such as what it provides you is an unfiltered static IPv4 address. Emphasis on *unfiltered*. When you use 44Net Connect, there is no firewall or other protection between the device you use with a 44Net Connect IPv4 address and “the rough neighborhood” of Internet bots and other attackers that will rapidly discover your new 44Net IPv4 address and begin probing and attacking it.

Thus a hosted, professionally administered service such as iShareRadio is an attractive option for clubs and even smaller groups such as families or just a few friends that want to share a remote radio

station amongst multiple users. The remote radio station “phones home” to a iShareRadio’s known, safe set of IP addresses via a secure connection. Thus “incoming” access is not required - the connections are only outgoing. Thus there’s no need for static IP addresses, or another middle service such as 44Net Connect, and it works with no issues, even with Starlink.

Non Radio System Integration

This nugget from the [FAQ](#) was instructive:

What is the Station Controller?

The iShareRadio platform can integrate to a number of products and one of the most exciting is the Station Controller by Sierra Radio Systems. This is a robust, modular and easy to configure solution to manage, control and monitor your radio equipment.

The iShareRadio platform has integrated with the Station Controller as it is perfect solution to managing all the equipment around a radio.

I have also seen references to [Node-RED](#) integration... so nearly anything could conceivably be managed within iShareRadio.

I’m looking forward to seeing iShareRadio complete its development and become a fully functional service.

Post Publication Update

Email from KJ6VU:

Thank you so much for covering iShareRadio in Zero Retries! That was a really wonderful surprise. Everything you said in the article was spot on with a few minor comments below.

Radio support

- The initial release of iShareRadio supports only Flex Radios. We are working on a solution for non-Flex radios but that will come later this year.
- The Station Controller will work with any radio or equipment today.

Schedule

- We are in beta now with several users.
- We will be in full production release and selling subscriptions as of Hamvention this year so in a month.

The pricing model will include...

- Free for end users to set up an account to access remote stations.
- Radio station hosts will pay an annual service fee. The price will scale with the number of users, radios, etc.

Marketplace

- We will be offering a “marketplace” where hosts can advertise their station for rent and users can book time for a fee.

- Of course, a radio host can offer their radio for free if they choose to do that.

Public / Private

- A host can offer their station privately or publicly.
- Private hosting means that only people who the host has invited to use their system by email will know about the station.
- Public hosting means the host will offer their station for anyone to rent time. The host has the approval of anyone requesting station access.

Please direct comments / feedback about this article to the [Zero Retries email list with the #ZR0248 hashtag](#).

Pebble HF - Under \$50 QRP HF Radio Kit

By Steve Stroh N8GNJ

In Zero Retries, I don't normally mention the many... *many... many...* low power HF radios that are constantly being developed, especially those that are intended solely or mostly for Morse Code (CW) use. But there's something different about the Pebble HF.

One attractive aspect of the [Pebble HF](#) is that the sponsors offer an engaging [backstory](#). It's the "product" of a couple of xOTA2 (outdoor casual operation) Amateur Radio Operators - Becky Spiceland N4BKY and Mike Spiceland N4FFF. They have a fun looking YouTube channel - [Ham Radio Duo](#).

Another is that in the video and on the web page, N4BKY and N4FFF don't shy away from comparisons with other (and in their own words, better) low power HF radio options. They are clearly focused on developing the Pebble HF to be a good enough, and inexpensive low power HF radio kit that is attractive to new, and potential, and budget conscious Amateur Radio Operators that want to "go outside and have fun on the air".

The development of the Pebble HF was done by two very experienced Amateur Radio Operators - Barb Asuroglu WB2CBA did the hardware, and Guido PE1NNZ did the firmware (with modifications by N4FFF).

Beyond those two elements, this low power HF radio offers a unique confluence of factors that make the Pebble HF Zero Retries Interesting - to me:

- [Hardware](#) design and [firmware](#) is open source.
- The price - "under \$50".
- The size - comfortably fits in a hand.
- The simplicity of a single band - [20 meters](#).
- Reasonable power - 5 watts with 12 volt input (or the flexibility of 1 watt with USB-C input).
- Although optimized for CW, it's usable for (Single Sideband) voice and digital (with an external digital interface). There's no view of the bottom of the unit where the audio connections are, but it appears to be small jack, hopefully with audio input, audio output, and Push To Talk.

- But there's this unclear reference:
*CW, SSB (USB/LSB), and digital mode capable**
(* an external usb sound card is required for digital modes)
- So does the "sound card" get connected to the USB-C? Or do you use an external interface such as a [Digirig Lite](#)?
- It's un-intimidating. It looks like learning to use it is the work of just a few minutes.
- Lastly... it's a kit... *a reasonable to build kit* where the soldering is a total of 14 through hole components, including the coils that you wind.

I can't quite explain why I find Pebble HF so interesting, more than the many other similar radios and kits. I guess one factor is that I can see showing this off to potential Amateur Radio Operators... *and it just seems so approachable* and simple - just a few connections. I could also see this being easy to demonstrate - plug in a common USB-C battery pack and a minimal dummy load and transmit across a room between two units.

Keeping to the approachable, un-intimidating paradigm, the ["Just OK Mini" 20 meter antenna - 20m band](#) would be a great starter antenna to pair with the Pebble HF.

Please direct comments / feedback about this article to the [Zero Retries email list with the #ZR0248 hashtag](#).

ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of **Zero Retries Interesting** items.

[Breaking News: FCC Grants Frequencies' Use For Satellite Service](#)

Amateur Radio Newsline Report 2530 for Friday, April 24th, 2026:

JIM/ANCHOR; We begin this week with breaking news. As Newsline prepared to go to production, the US Federal Communications Commission announced that it had authorized AST SpaceMobile's full, 248-satellite constellation to use requested parts of the radio spectrum, including those that had drawn objections from the amateur radio community.

The agency's move will permit AST to fulfill its goal of providing services to consumers in so-called "dead zones," regions without terrestrial networks, especially for emergency services. The successful application on behalf of the low-Earth orbit satellite system was granted on the 21st of April with conditions. The grant for the use of 698 to 960 MHz includes permission to make use of 430 to 440 MHz for emergency control and tracking of the satellites - a move that amateur radio operators feared would cause interference with hams' operations.

The FCC said that AST emergency telemetry use will be limited to the 430.5MHz, 432.3MHz, 434.1MHz, 435.9MHz, and 439.5MHz frequencies for a duration of less than 24 hours. The FCC has said in the past that interference with ham radio was "unlikely."

(FCC, PC MAGAZINE AUSTRALIA)

[Echo App for iOS Devices](#)

9:41



WWV Time Signal

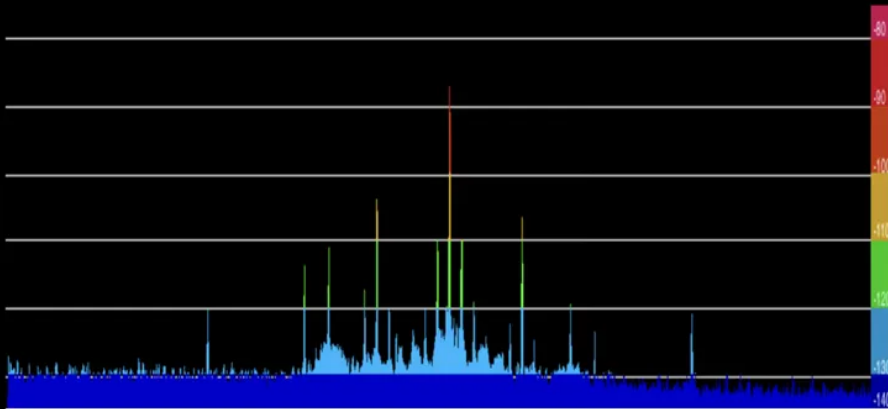


10,000.00 AM



SIGNAL

SERVER: AUSTIN



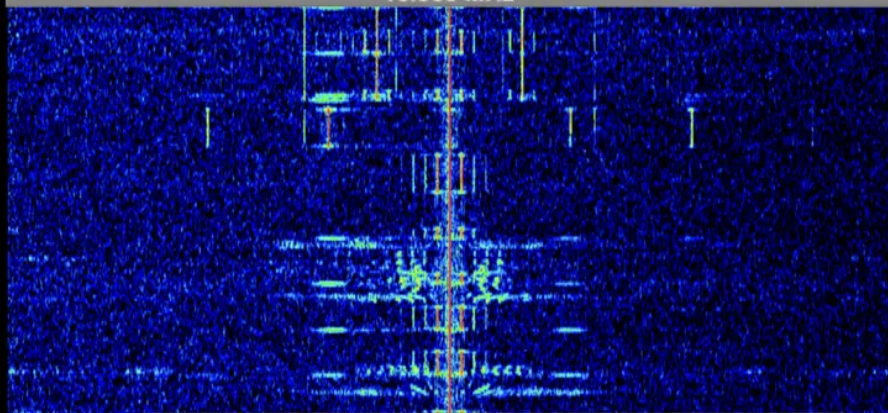
RUS

BPM

WWVH / WWV

database: stored

10.000 MHz



10000.00

select band

extension



A



Spec RF



AM

SAM

DRM

LSB

USB

CW

NBFM

IQ



RF

WF12

Audio

AGC

User

Stat

Off

S1

S3

S5

S7

S9

+10

+20

+40

+60

-80.3

dBm

Image courtesy of echosdr.com

Visualize the Spectrum

See the invisible. Stream raw waterfall data directly from KiwiSDR, OpenWebRX, WebSDR, and FM-DX Webservers to explore the radio spectrum in real time on a fluid, hardware-accelerated canvas.

Listen to Anything, From Anywhere

Echo turns your iPhone and iPad into a global radio receiver. Browse 2,000+ KiwiSDR, OpenWebRX, WebSDR, and FM-DX Webservers to hear shortwave, aviation, numbers stations, and distant FM in real time.

This is a really gorgeous iOS application. It's free to download and use, and in three clicks I had selected a receiver, and a portion of spectrum / station / net to listen to, and it just worked. This is an impressive demonstration of the utility of the global network of radio receivers being made available for use for free via Internet.

I can just imagine how useful this is in testing out one's station - do a quick test while using this app tuned to a remote receiver. Talk about fast feedback!

We really seem to need a lot more remote receivers here in the Pacific Northwest. I need to get my KiwiSDR online.

My thanks to Conrad Trautmann N2YCH for mentioning this for inclusion in Zero Retries.

Hibbian Installer First Release

Dave "hibby" Hibberd MM0RFN via email:

I've been working on my Linux side projects, and I've hit a point where I'm pretty happy with the work done and have things to announce that are probably ZR Interesting!

I've finally got weekly builds of a live running & installable Debian for hams available.

It contains the bulk of the amateur radio software we ship in Debian pre-installed, and has the 'backports' distribution of more modern software not normally available for Debian stable active, so you can run the recent wsjtx 3.0 out the box, for example, which otherwise won't ship as Debian Stable until our next major release in 2027ish.

As it's a 'live' distribution, it'll run straight from a USB stick, bypassing whatever is installed on your computer not touching the existing hard drive, so it makes quickly repurposing a personal computer/ laptop for a contest or special event easy too.

There's also a raspberry pi image built with the same ethos, so your shack pi can be usable out the box without hours spent finding and downloading packages.

From the website:

I'm genuinely thrilled to announce that after years of me working away, one small project at a time, it is now possible to head over to download.hibbian.org and download either a PC or a Raspberry Pi image!

PC Live & Installer Image - Stable

This is an iso compatible with any amd64 computer - this comprises most machines sold in the last 15 years.

That said, I'd recommend at least 4GB RAM, preferably 8GB, and a not too old CPU. If there's enough demand for a lightweight environment for old machines, I can add this to make life nicer.

The image needs to be written to a USB stick - on Windows I'd recommend [Rufus](#). When the PC boots you will meet a live environment running Debian Stable & [KDE Plasma 5](#) which contains the majority of the Debian Hamradio packages. You may check the list in the latest [release notes](#).

These are the latest versions of the packages available in Debian - either backported by my colleagues in the [Debian Hams](#) team or quietly ported to the Hibbian Repo by me to ensure compatibility.

The image contains an installer so you can easily install to your local system if you prefer the conventional approach of running from a hard drive or you can ignore it and use the live image directly as your system disk!

This live distribution capability for Linux Amateur Radio apps is really welcome, especially for Raspberry Pi. This lowers the barrier to entry of using Linux considerably as "if you screw it up, just reboot and try again". Then exit out and your system is back to normal (Windows, etc.). Speaking for myself, this would be especially welcome for Raspberry Pi as it could be distributed to prospective Amateur Radio users and probably usable enough for the Raspberry Pi 3B+ (only \$40).

Kudos to MM0RFN for Hibbian 1.0 (?) and my thanks to him for mentioning this for inclusion in Zero Retries.

[Announcing the VARAtrack APRS-over-VARA APRS Tracker](#)

Stephen H. Smith WA8LMF on the aprssig email list:

Several years and 15,000 miles of road-trip drive-testing, using the VARA high-performance HF modem alongside traditional AX.25 HF packet, has shown VARA to be orders of magnitude superior for reliably transmitting APRS position reports on HF.

VARA exists exclusively as a Windows-based sound-card "soft modem" - the only way to do APRS-over-VARA has been to use a mobile laptop or Windows tablet in the vehicle. No simple hardware-only solution analogous to the Byonics TinyTrack for classic packet exists.

Recently, very inexpensive (starting at USD \$139) tiny Windows-based ultra-compact computers known as "stick PCs" have become available. These devices are very small fully-functional 64-bit Intel-based quad-core PCs. They include 4 USB-C ports, 1GB Ethernet port, WiFi 5, Bluetooth 5, a Realtek HD sound system, and 4K-capable HDMI video. Further, these devices run directly from 12 VDC, making them ideal for mobile applications!

These devices are widely used to drive the 42" monitors displaying menus over the counter at fast-food places, and in airports for displaying incoming and outgoing flights. I have now one setup one to operate as a stand-alone APRS-over-VARA tracker.

Full details on the VARAtrack setup are on my website at:

<http://WA8LMF.net/VARA>

Scroll down the page and follow the link on that page for “The VARAtrack”. Near the bottom of the VARAtrack page is a link to download a backup image file of my entire setup that can be used to restore the entire setup to another similar stick PC.

I will be demonstrating the VARAtrack at the Dayton Hamvention at my radio trailer aka “Studio B” in the Emergency Comms Vehicles Expo.



WA8LMF has been working on testing this solution - APRS over VARA HF for some time. I agree with him that using an inexpensive Windows computer as a “VARA appliance” is the most practical way to use VARA HF (or VARA FM).

Beyond VARA HF, there are other *potential* solutions for APRS over HF that are more robust than legacy 300 bps AX.25 packet radio, including:

- [NinoTNC](#) (see the section **Latest SSB and FM modes - Improved Layer 2 Protocol with supplemental CRC. These are intended to work on SSB sideband channels or with Mic/ Speaker connections on FM transceivers.**)
- [Mercury Modem](#)
- [Hush](#)

Related - My [Zero Retries Guide to Amateur Radio HF Data Communications](#) was recently updated with some related information.

[Graywolf - Modern APRS Station](#)

Project by Chris Snell KN6TLO (? Pretty sure.):

Modern APRS station — software modem, digipeater, iGate, and web UI

Graywolf is a complete APRS station that replaces a hardware TNC with a software modem. Plug a radio into a USB sound card, install graywolf, and configure everything from your browser. No external sound card software, no config files to hand-edit — just a single binary and a web UI.


graywolf

[Dashboard](#)
[Live Map](#)

OPERATIONS
[Beacons](#)
[Digipeater](#)
[iGate](#)
[Logs](#)

SETTINGS
[Channels](#)
[Audio Devices](#)
[PTT](#)
[GPS](#)
[Position Log](#)
[Simulation](#)

INTERFACES
[KISS](#)
[AGW](#)

[About](#)

DASHBOARD

Live station overview

RX Ready

TX Audio Ready

CH3: VHF APRS

AFSK 1200 bd

BCD

RX

TX

RX: 67

TX: 10

Beacon Now: NWSM-5

67

PACKETS RX

10

PACKETS TX

64

IGATED

0h 21m

UPTIME

40.4759°N, 111.8454°W

GPS - 1907M

LIVE

20 entries

TIME	DIRECTION	ORIGIN	CH	SOURCE	DEST	TYPE	DEVICE	DISTANCE
4/13 10:42:05	Received	—	3	N7UNX-5	TQ4RVR	mic-e	Kenwood TH-D700	85.3 mi via SHEPRD
N7UNX-5>TQ4RVR,KF6RAL-10*,WIDE1*,SHEPRD*,WIDE2-1:1"N,nAAR/J"Bg)=								
4/13 10:42:14	APRS-IS	iGate RF-IS	3	N7UNX-5	TQ4RVW	mic-e	Kenwood TH-D700	85.3 mi via SHEPRD
N7UNX-5>TQ4RVW,KF6RAL-10*,WIDE1*,SHEPRD*,WIDE2-1:1"N,nAAR/J"Bg)Here I Am N7UNX WinLink								
4/13 10:42:14	Received	—	3	N7UNX-5	TQ4RVW	mic-e	Kenwood TH-D700	85.3 mi via SHEPRD
N7UNX-5>TQ4RVW,KF6RAL-10*,WIDE1*,SHEPRD*,WIDE2-1:1"N,nAAR/J"Bg)Here I Am N7UNX WinLink								
4/13 10:42:24	APRS-IS	iGate RF-IS	3	N7UNX-5	TQ4RWS	mic-e	Kenwood TH-D700	85.4 mi via SHEPRD
N7UNX-5>TQ4RWS,KF6RAL-10*,WIDE1*,SHEPRD*,WIDE2-1:1"qAR,NWSM-5:1"N,nAUSK/J"Bg)=								
4/13 10:42:24	Received	—	3	N7UNX-5	TQ4RWS	mic-e	Kenwood TH-D700	85.4 mi via SHEPRD
N7UNX-5>TQ4RWS,KF6RAL-10*,WIDE1*,SHEPRD*,WIDE2-1:1"N,nAUSK/J"Bg)=								
4/13 10:42:30	APRS-IS	iGate RF-IS	3	K7UHP-2	4QPRRW	mic-e	Kenwood TH-D700	39.5 mi via SHEPRD
K7UHP-2>4QPRRW,SHEPRD*,WIDE1*,WIDE2-1:1"qAR,NWSM-5:1"W,1-~/J"B2)449.875MHzout & about=								
4/13 10:42:30	Received	—	3	K7UHP-2	4QPRRW	mic-e	Kenwood TH-D700	39.5 mi via SHEPRD
K7UHP-2>4QPRRW,SHEPRD*,WIDE1*,WIDE2-1:1"W,1-~/J"B2)449.875MHzout & about=								
4/13 10:42:30	Received	—	3	K7UHP-2	4QPRRW	mic-e	Kenwood TH-D700	39.5 mi via N7BYU-1
K7UHP-2>4QPRRW,KF6RAL-1*,N7BYU-1*,WIDE2-1:1"W,1-~/J"B2)449.875MHzout & about=								

graywolf 0.8.4

The dashboard shows real-time station status and a live packet feed

WHAT YOU CAN DO

Run a digipeater

Set up a fill-in or wide-area digipeater with WIDEn-N path handling, duplicate suppression, and cross-channel routing. Configurable rules let you control exactly what gets repeated.

Run an iGate

Bridge your local RF network to APRS-IS. Receive-only or bidirectional — gate RF packets to the internet and deliver APRS messages from the internet back to RF.

Beacon your position

Fixed station beacons, GPS-driven mobile trackers with SmartBeacon rate adaptation, APRS objects for repeaters or events, and custom status beacons.

Serve as a TNC

Expose KISS and AGWPE interfaces so other packet software (Xastir, YAAC, pinpoint, aprx, APRSdroid) can use graywolf as their modem over TCP, serial, or Bluetooth.

Combine everything

Run a digipeater, iGate, position beacon, and KISS server all at once on the same radio channel — or spread them across multiple channels and radios.

More technological innovation in Amateur Radio! Its interesting / reassuring for the future of Amateur Radio that there are folks like KN6TLO (and *many* others) who aren't content with the status quo, same old, same old Amateur Radio paradigms and are willing to reimagine Amateur Radio technologies... even those that seem "static" like APRS.

[New SCS PXdragon DR-9400 PACTOR Modem](#)

(Link is to DX Engineering website)



Developed by SCS and distributed by WiMo, the PXdragon DR-9400 supports PACTOR-1/-2/-3 and PACTOR-4, Packet Radio and APRS with 1200 bps AFSK and 9600 bps G3RUH and Robust Packet Radio. Reception modes such as Weather-FAX (RX) and RTTY (RX) and an integrated PACTOR monitor expand the range of applications. Its compact design makes the DR-9400 ideal for stationary and portable operation—perfect for email messaging, file synchronization, telemetry, or APRS beaconing. Modern signal processing, versatile interfaces, and robust protocols make the PXdragon DR-9400 a reliable solution for data-oriented radio operation, even in poor propagation conditions.

...

SPECIFICATIONS SCS PXdragon DR-9400 PACTOR Modems

Supported Operating Modes:

- PACTOR-1 / -2 / -3 / -4
- PACTOR Monitor
- Packet Radio (9k6 G3RUH, 1k2 AFSK)
- Robust Packet Radio (RPR)
- APRS (Automatic Beaconsing)
- Weather-FAX (Receive only)
- RTTY (Receive only)

It's encouraging that SCS supports Amateur Radio Packet Radio 1200 and 9600 bps in this latest generation of their Pactor modems.

My thanks to Brian O'Connor KA2CGB for mentioning this for inclusion in Zero Retries.

[Stix Radio April Update](#)

From Patreon email update and website:

[Background:](#)

At its core, the Radio is a handheld, Linux-based (Armbian) radio platform that blends analog VHF/ UHF FM voice with LoRa data networking, GNSS and Wi-Fi connectivity. It's designed to feel like a modern "smart walkie-talkie" — a decent hybrid between a classic handheld transceiver and a connected computing device.

... REV-C board spin. This includes:

- Cleaning up the power architecture
- Improving stability across the different voltage rails
- Making sure everything behaves properly under load (especially RF + display + CPU all running together)

Given how complex this board is — with RF, audio, high-speed digital, and power all interacting — this kind of iteration is honestly expected. It's much better to catch it now than later. I have always banked on at least 4 to 5 revisions as the bare minimum, so no drama.

This is a project worth following. The graphics (FT8, APRS) give some indication that beyond LoRa, there will be some built-in digital / data functionality on the VHF / UHF FM radio.

[Reviving Teletext for Ham Radio > Hack the airwaves with some of the best tech of the 1980s](#)

Stephen Cass KB1WNR in IEEE Spectrum:

Putting Teletext Back on the Air

I wanted to do something a little different. Inspired by how the [BBC Micro](#) co-opted teletext for its own purposes, I thought it might make a great radio protocol. In particular I thought it could be a digital counterpart to [slow-scan television](#) (SSTV).

SSTV is an analog method of transmitting pictures, typically including banners with ham-radio call signs and other messages. SSTV is fun, but, true to its name, it's slow—the most popular protocols take [a little under 2 minutes to send an image](#)—and it can be tricky to get a complete picture with legible text. For that reason, SSTV images are often broadcast multiple times.

I decided to send the teletext using the [AX.25](#) protocol, which encodes ones and zeros as audible tones. For [VHF and UHF transmissions](#) at a rate of 1,200 baud, it would take 11 seconds to send one teletext screen. Over [HF bands](#), AX.25 data is normally sent at 300 baud, which would result in a still-acceptable 44 seconds per screen. When a teletext page is sent repeatedly, any missed or corrupted rows are filled in with new ones. So in a little over 2 minutes, I could send a screen three times over HF, and the receiver would automatically combine the data. I also wanted to build the system in [Python](#) for portability, with an editor for creating pages, an AX.25 encoder and decoder, and a monitor for displaying received images.

The reason why I hadn't done this before was because it requires digesting the details of the [AX.25 standard](#) and [teletext's official spec](#), and then translating them into a suite of software, which I never seemed to have the time to do. So I tried an experiment within an experiment, and turned to vibe coding.

Despite the popularity of vibe coding with developers, I have reservations. Even if concerns about [AI slop](#), [the environment](#), and [memory hoarding](#) were not on the table, I would still worry about the [reliance on centralized systems](#) that vibe coding brings. The whole point of a [DIY](#) project is to, well, do it yourself. A DIY project lets you craft things for your own purposes, not just operate within someone else's profit margins and policies.

Still, criticizing a technology from afar isn't ideal, so I directed [Anthropic's Claude](#) toward the AX.25 and teletext specs and told it what I wanted. After about 250,000 to 300,000 tokens and several nights of back and forth about bugs and features, I had the complete system running without writing a single line of code. Being honest with myself, I doubt this system—which I'm calling Spectel—would ever have come about without vibe coding.

But I didn't learn anything new about how teletext works, and only a little bit more about AX.25. Updates are contingent on my paying Anthropic's fees. So I remain deeply ambivalent about vibe coding. And one final test remains in any case: trying Spectel out on HF bands. Of course, that means I'll need willing partners out in the [ether](#). So if you're a ham who'd like to help out, let me know in the comments below!

I knew of teletext and had even seen it in an expensive hotel room. It was indeed useful to get this stream of information available. I had no idea of the elegance and efficiency of Teletext that KB1WNR describes.

But I think that KB1WNR buries the lede about his experiment in Amateur Radio vibe coding software development... **it worked!** He started with an idea that he didn't have the skills or knowledge to tackle entirely on his own. The idea wasn't so compelling or universally useful that it justified devoting significant time and energy on his part, such as digesting the AX.25 and teletext specifications, or enlisting the help of others. Thus, on "hobby time", using an AI assistant, he was able to develop a working system... again, *from just an idea*.

And, I think, writ large, unique new modes like this is going to be increasingly the norm in Amateur Radio. The nature of Amateur Radio encourages such experimentation. As KB1WNR proves out, vibe coding enables a person with some (perhaps minimal) some technical skill to create entirely new

digital modes that can then (after being “documented publicly” per FCC Part 97 regulations) be used on Amateur Radio spectrum. While vibe coding might end up being expensive at the moment, surely the rapid evolution of AI technology - more efficient models, more capable hardware will render such hobby projects as unprofessional vibe coding, affordable on a hobby budget.

I was not able to find any public documentation of Spectel beyond this article, and thus I encouraged KB1WMR to do so in the comments section of the article. I also wasn’t able to find any direct contact info for KB1WMR, so apparently the comments section of the article is the only way to “contact” him.

My thanks to Bennett Z. Kobb AK4AV for mentioning this for inclusion in Zero Retries.

IEEE Spectrum’s Modern Amateur Radio Stories Archive

The preceding item is *just the latest* of a series of great treatments of Amateur Radio in IEEE Spectrum. Stories about Amateur Radio in IEEE Spectrum consistently portray Amateur Radio as relevant and interesting in the 21st century. I particularly appreciate these articles as explaining that Amateur Radio is useful to get hands-on experience with radio technology. These articles are always readable and interesting for IEEE Spectrum’s readership with an assumed technical background.

IEEE Spectrum articles tag: [Amateur Radio](#)

IEEE Spectrum articles tag: [Ham Radio](#)

Microwave Update 2026 in Rochester, NY is Open for Registrations

Email from Dave Carlson N2OA:

The Microwave Update conference for 2026 in Rochester, NY is open for registrations. We have a great lineup of speakers, a tour of the Antique Wireless Association (AWA) is available <https://www.antiquewireless.org/homepage>, and we should have some nice prizes. Presentations will be held at L3Harris.

<https://microwaveupdate.org/MUD2026>

Microwave Update 2026

— REGISTRATION NOW OPEN!! —

Friday October 23 – Saturday October 24

DoubleTree by Hilton – 1111 Jefferson Road, Rochester, NY 14623

Group Rate of \$159 per night - Reservations currently being accepted

Call 1-800-774-1500 for hotel reservations

Group Code - Microwave Update 2026- Host ROC VHF Group

See the website for conference registration, online hotel reservations, schedule, local attractions and Thursday early arrival details

www.MicrowaveUpdate.org

Questions? Email: MicrowaveUpdate2026@gmail.com



L3HARRIS®



I couldn't (quickly) find a reference to what the primary activities are at the [L3Harris](http://www.L3Harris.com) facility near Rochester, New York, but I'm sure there's ample Zero Retries Interesting activities there. Microwave Update is one of the great *technical* conferences in Amateur Radio, and definitely recommended if you're interested in microwave communications in Amateur Radio.

Now mentioned in the latest update of [Zero Retries Guide to Zero Retries Interesting Events](#).

SteppIR Resumes Sales to Amateur Radio

One time popup notification on <https://consumer.steppir.com>:

STEPPIR CONSUMER PRODUCT

ANNOUNCEMENT



As our amateur radio customers know, we exited the consumer market in June of 2025. At that time, we did not know what our exact future was – our plan was to pursue commercial projects in search of more stable long-term income sources, but we never lost hope on the idea of returning to the amateur radio market in some form.

Thanks to some recent (and continuing) exciting developments on the commercial side of things, SteppIR will now be able to guarantee future sales of our consumer product line via online web sales!

All parts and accessories that are on our website are available for purchase and will continue to be available into the future. Multiple items have been substantially reduced in price.

We will be bringing back select antennas that will be purchased as kits on our website – Urban Beam Yagi 40m-6m (dipole on 40m/30m), 3 element Yagi 20m-6m, 4 element Yagi 20m-6m. The 3E and 4E Yagi will also have the 40/30 loop dipole option available.

We will also be selling the SmallIR vertical 20m-6m, and the BigIR vertical, 40m-6m.

Warranty support and services will be in effect for these antennas as well as any purchased parts and accessories

DUE TO THESE COMMERCIAL
PRODUCT DEVELOPMENT EFFORTS,
WE BELIEVE WE WILL BE ABLE TO
INTRODUCE SOME EXCITING NEW
PRODUCTS FOR THE CONSUMER
MARKET THAT WILL ENHANCE ALL
EXISTING AND FUTURE STEPPIR
ANTENNAS, IN THE NOT-TOO-
DISTANT FUTURE.

steppIR
COMMUNICATION SYSTEMS

This is good news for Amateur Radio! I'm still in awe of SteppIR's "mechanically tuned antennas". I wouldn't have imagined such an approach was viable until SteppIR proved out the concept.

[Arcanum: ORI's New Open Source Antenna Simulation Engine](#)

Michelle Thompson W5NYV on the Open Research Institute web page:

...

The solution to these limitations exists. It is called the Conformal Method of Moments with Exact Kernel (CMoM). This approach replaces NEC-2's straight-segment approximations with curved segments. The NEC-2 kernel is replaced with the full cylindrical surface integral. This means that we get more accurate modeling for exactly the antenna types that matter most to ORI's work, such as ground station helices, compact loaded dipoles, loops, and arrays.

There is exactly one production software implementation of CMoM with exact kernel in the world. It is proprietary and the current price is \$1599 USD per year for the license.

Until now, that has been the end of the story for anyone who needed high-fidelity curved-wire antenna modeling without a commercial license. We decided to do something about that. Arcanum changes things.

What Arcanum Is

Arcanum is ORI's new open source CMoM antenna simulation engine. It is, to the best of our knowledge, the first open source implementation of the Conformal Method of Moments with Exact Kernel.

The name is intentional. An arcanum is hidden or secret knowledge. The mathematical techniques underlying CMoM have been in the academic literature for decades. Champagne, Williams, and

Wilton described the curved-segment approach in 1992. This reference is listed in the Arcanum bibliography. We assemble these approaches into an accessible, open, community-owned tool. That is what we are building.

...

This is yet another interesting example of technological innovation (adjacent to) Amateur Radio. Given the increased interest within Amateur Radio about space communications, and ORI's ongoing work in space communications, this ability to model antennas for ground station use more precisely will be highly useful.

The open source aspect of this system gets even more interesting when it can be used with an AI - imagine interactively modeling theoretical antenna designs.

My thanks to [Amateur Radio Weekly Issue 417](#) for mentioning this.

[QRX - APRS Missed Message Mailbox](#)

New service for Amateur Radio APRS by Jesse Forkum N0JLF:

Q-code: "Wait / Stand by" — your messages are standing by.

Get started from any APRS radio or client

Send REG to QRX

That's it. QRX will hold messages you miss while offline.

WHAT IS QRX?

QRX is a passive APRS message safety net. It monitors APRS-IS for messages addressed to your callsign, watches for acknowledgment, and **stores any unacknowledged messages** for later retrieval.

When you come back online (detected via position beacon), QRX notifies you of missed messages. Think of it as **voicemail for APRS**.

QRX never ACKs on your behalf, never retransmits messages, and never injects itself into the delivery path. It is purely an observer that catches what falls through the cracks.

HOW IT WORKS

1. Someone sends you an APRS message while your radio is off
2. QRX sees the message on APRS-IS, waits 5 minutes for your ACK
3. No ACK observed — QRX stores the message
4. You turn your radio on and beacon a position
5. QRX sees your beacon and sends you a notification
6. You send R to read messages one by one, like voicemail

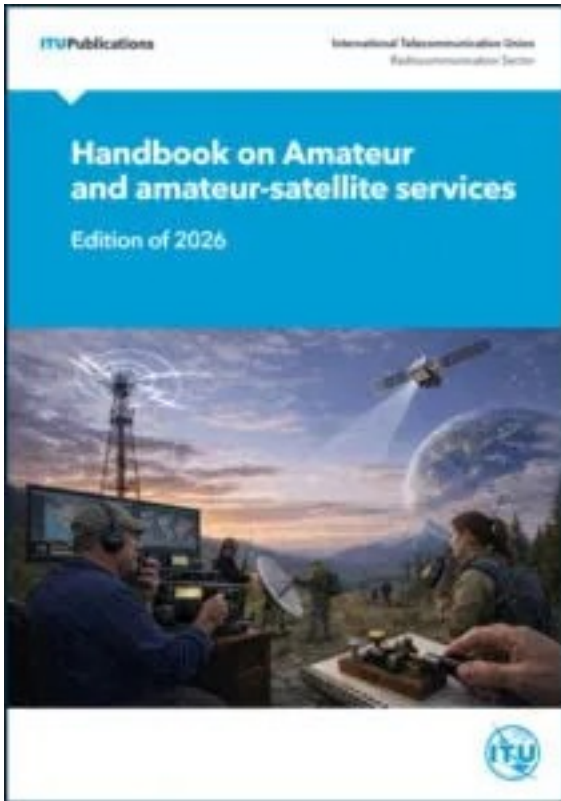
There's an unstated requirement that for QRX to work *via radio* that there must be an APRS (receive and transmit) Igate in your area.

My thanks to [Amateur Radio Weekly Issue 417](#) for mentioning this.

New 2026 ITU Handbook on Amateur and Amateur-Satellite Services Released

Frank Karnauskas in [ANS-109 AMSAT News Service Weekly Bulletins](#):

The International Telecommunication Union (ITU) has published the 2026 edition of the Handbook on Amateur and Amateur-Satellite Services . The updated reference provides comprehensive information on the amateur and amateur-satellite services, including relevant ITU regulatory texts, technical guidelines, and operational practices.



IARU President Tim Ellam, VE6SH/G4HUA, highlighted the handbook's release, noting its value to national administrations, regulators, and amateur radio organizations worldwide. The document serves as an essential resource for anyone involved in frequency coordination, licensing, or satellite project planning.

The handbook is available for download free-of-charge at <https://www.itu.int/pub/R-HDB-52-2026>.

[La Plata County Colorado Weather Radar](#)

La Plata County has partnered with the Colorado Department of Local Affairs, the Colorado Water Conservation Board Water, and the Colorado Division of Homeland Security and Emergency Management to acquire, install and operate a permanent weather radar station in southwest Colorado on land adjacent to the Durango-La Plata County Airport. The radar is locally owned by La Plata County.

This game-changer in preparedness for the region came on the heels of the 416 Fire in 2018 and the floods and mudslides that followed during annual monsoons. Relying on radar imagery from stations in Grand Junction, Albuquerque and Flagstaff – the closest radars until now - painted an incomplete picture of what was headed this way. This is because most of the storms that hit La Plata County and its surrounding areas form at or below 28,000 feet, which falls below eyeshot of those other radar

stations.

The 416 Fire prompted a solution to this long-recognized gap in coverage, when the Colorado Department of Local Affairs extended a \$1.7 million grant to fund a significant portion of the roughly \$2.6 million project, with the remainder funded by La Plata County, Colorado Department of Transportation, Colorado Department of Natural Resources and other local partners pitching in for its operation and maintenance.

This is another example of (that I was unaware of), smaller scale weather RADAR systems to monitor weather conditions in local, rural areas not well covered by existing National Weather Service or urban weather RADAR systems.

My thanks to Chuck Kimball N0NHJ for mentioning this for inclusion in Zero Retries.

[N0NHJ's QRZ page](#) is worth a look:

From 1998 through 2018 I completed 18 deployments in the Antarctic as a Satellite and Communications engineer. I worked at all three year round US Research stations...

First Computer Decoded Morse Code in 1975?

This was an interesting discussion I saw in passing about an Amateur Radio Operator's involvement, including the Amateur Radio National Traffic System, in a US military project to automatically decode Morse Code transmissions via radio.

[Jack Haverty on the Internet-history email list](#):

...

It started in 1963. In high school, I was interested in STEM (acronym not yet in existence though), had joined the school's Radio Club, gotten a amateur radio ("ham") license, and somehow gotten involved in something (in the US) called the National Traffic System (NTS - that acronym did exist).

NTS was a network. Actually an Internet. Actually a multi-technology Internet of interconnected networks. It had been evolving since shortly after World War II. Packets (think telegrams or emails) were transported around the world. There were LANs covering cities, Regional nets over the US, and gateways to nets covering other parts of the world. Even a TransContinentalCorps (TCC) that acted as a WAN.

I learned about all sorts of the technical mechanisms that operated inside the network: routing, flow control, addresses, error control, protocols for retransmissions, compression techniques, etc.

NTS typically carried messages such as Birthday Greetings, e.g., from a soldier stationed in Guantanamo Bay (address: "GITMO") to a family member back home somewhere in the US. Although most of the distance was covered by radio, using Morse Code, the final link might use a different "LAN", e.g., a telephone call or even simply driving to the house and delivering a piece of paper. NTS still operates today. More details at https://en.wikipedia.org/wiki/National_Traffic_System if you're curious.

When I was in Lick's orbit at MIT, that experience made it easy for me to understand the ARPANET. Later also the Internet. Techniques were different but the problems remained the same.

At one point circa 1975, ARPA asked for our help with a critical DoD need. They wanted computers to be able decode hand-sent Morse code. No one ever explained exactly why to us tech grunts, but we

knew Morse was being used by both the good and bad guys. The AI technology of the day was “Expert Systems”. We were tasked to use whatever we thought would help solve the problem.

That started a project which lasted several years, and produced a system which did about as well, possibly even better, than a human operator. From my high school experience, I acted as the “Expert”, and we had a series of staff and student projects to make the PDP-10 do the same things I had learned to do while participating in the radio network. ARPA was happy. DoD was happy. No ham operator could afford the millions of dollars to have their own PDP-10 system, but the government didn't have that constraint.

The project even appeared in a 1990 Mitre report I think of as a compendium of “ARPA's Greatest Hits”. See Chapter 22 of <https://apps.dtic.mil/sti/tr/pdf/ADA239925.pdf> (FYI, ARPANET is Chapter 20 of same report).

Some Zero Retries Interesting Forums at Hamvention 2026 - NewTechHams

Spotted in passing browsing the Hamvention website:

Hackers in Amateur Radio

[Friday] Begin: 2:30 PM / End: 3:20 PM

Location: Room 4

Moderator: Jeremy Hong, KD8TUO

Join Jeremy Hong (KD8TUO), Ed Wilson (N2XDD), Arsenio Menendez (KN4OIH), Terry Schanno (NV0O) and Brian Raker (W4WWW) explore the overlap and coexistence of the amateur radio and hacker communities, and how each has influenced the other. We will discuss how modern tools and platforms like Software Defined Radio (SDR) and Meshtastic are enabling new experimentation, rapid prototyping, and open source collaboration in Amateur Radio. We will also highlight how hacker spaces and conferences are becoming major entry points into the hobby. Attendees can expect practical examples, community perspectives, and ideas for welcoming and collaborating across both worlds.

Radio Club of America - Youth Forum

[Saturday] Begin: 9:15 AM / End: 10:50 AM

Location: Room 3

Moderator: Jim Storms, AB8YK

Join Moderator Jim Storms and some impressive young hams. Webelos Scout Adam Grubb (KF8EKW) is currently building a 70cm EME station for his school science project. Carsten Glasbrenner's (KQ4SJM) main interests are satellites and DIY projects, such as home brew antennas and simple soldering kits. Haley Pendell (KE2EVX) is active operating POTA, contesting with her radio club friends, and participating in nets, serving as net control for her local 2m net on Saturdays, and building DIY antennas. Maggie Dill (KR4FTN) is active in POTA activations and hosting nets on the local repeaters on her own. She has participated in Field Days and state QSO parties as an operator for the local Charlotte club (W4BFB) of which she is a member. She is sharpening her CW skills and can send/receive up to 25 WPM at the moment, and enjoys activating parks in CW.

Teaching a One-Day Tech Class

[Sunday] Begin: 10:25 AM / End: 11:25 AM

Location: Room 3

Moderator: Dan Romanchik, KB6NU

Join Dan Romanchik (KB6NU) of ARROW, and learn why is it important to teach ham radio classes. He will address why it is better to teach a one-day class instead of a traditional multi-session class, where can you hold the class, publicizing the class, possible fees, timing, teaching techniques, and student follow up.

It's refreshing to see some attention paid to the particular issues in trying to reach out to NewTechHams at a high profile independent conference like Hamvention.

I'm in violent agreement with KB6NU about the value of a one-day class to reach NewTechHams - they often have enough general technical background to understand the basics of Amateur Radio, and can quickly self-educate on any sticking points they encounter.

AMSAT/TAPR Banquet to Feature Ray Roberge, WA1CYB, Update on AMSAT's SDR Gen2

Also Zero Retries Interesting at Hamvention 2026, Frank Karnauskas in [ANS-109 AMSAT News Service Weekly Bulletins](#):

Ray Roberge, WA1CYB, will be the speaker at the 17th annual AMSAT/TAPR Banquet. Roberge, a member of AMSAT's Engineering team, will speak about progress on AMSAT's SDR Gen2 project, including what it does and where it can be used.

AMSAT's SDR Gen2 is a versatile, programmable GNU Radio transceiver/transponder designed for a 1U CubeSat footprint. The transceiver has 144 MHz – 6 GHz continuous coverage with 10 GHz coverage expected as well. The transceiver will support direct VHF, UHF, L, S, C, and X band operations in all modes – CW, SSB, FT8, NBFM, SSTV, FSTV, etc. and a downlink data rate of up to 1 Mbps. This transceiver is being built to fly on GOLF and FoxPlus missions and will be both open source hardware and software.

The 17th annual AMSAT/TAPR Banquet will be held at the Kohler Presidential Banquet Center on Friday, May 15th at 18:30 EDT.

Learning more details about the AMSAT SDR Gen2 might be a reason to attend this event.

Brief Thought Experiment - SuperPeater Transmitter on 50-54 MHz @ 500 Watts

In researching the article on iShareRadio, I checked in on FlexRadio's website and saw that "Aurora" which debuted at Hamvention 2025 as a prototype, is now a product *line*, beginning with the [Aurora AU-510](#).

Recall that the signature feature of the Aurora is (up to) 500 watts output, and able to generate that power incredibly efficiently (uses Polar Modulation) from a standard 120 volt 15 amp circuit. **500 watts** with no significant strain; the demo prototype at Hamvention 2025 was keyed down continuously and was barely warm to the touch.

One of the modes of the Aurora series is **FM**.

One of the frequency ranges of the Aurora series is **50-54 MHz**.

50-54 MHz propagates *really* well. Recall that "Low VHF" was the preferred frequency range for wide area two way communications like the early California Highway Patrol.

So... what if an Aurora, operating at 500 watts, FM, on 50-54 MHz was the output of a cross band [SuperPeater](#)... Perhaps at 500 watts it's a **MegaPeater**.

It might take a bit of persuasion at FlexRadio to create a new mode to transmit a 20 kHz bandwidth (max currently permitted on 50-54 MHz for US users) signal, but imagine that paired with the upcoming “Audio OFDM” modes.

50-54 MHz, especially at 500 watts, would be trivial to receive using a Raspberry Pi and Software Defined Receiver, as I envision in the SuperPeater concept.

Queue a certain [iconic movie theme song](#); but fun food for thought...

Video - Groundbreaking Research Transmits Energy from Space to Earth

It puzzles me why this particular development is so “groundbreaking” as I recall that there have been many such (small scale, low power) demonstrations of microwave transmission of power from satellites to a receiver on Earth.

[GuRu Wireless](#) is the commercialization of this particular technology, and apparently it operates at 24 GHz. Power transfer via microwave radio is yet another “eventually critical” radio technology that’s going to need more technologists. It would be interesting to put a power transmitter in your backyard and have a drone staying on station a few hundred feet up, relaying... say, AREDN signals as part of the backchannel of your power beam to the drone. Or, I suppose the 160m fans would enjoy having a full wavelength 160m vertical antenna.

Video - FAST: China’s Radio Telescope Behemoth

Megaprojects YouTube channel:

AI-generated video summary :

Megaprojects explores the engineering ingenuity behind the 500-meter Aperture Spherical Telescope. This film details the decades-long development process, the unique active surface technology that enables precise sky tracking, and the significant social impact of creating a massive radio-quiet zone in Guizhou province.

Whatever the rivalries between China and the US, I’m proud, as a human interested in the furtherance of science and technology *for humanity as a whole*, **especially in space**, to celebrate the advances of science **and space technology** such as China’s [Five-Hundred-Meter Aperture Spherical Telescope](#):

It has a novel design, using an active surface made of 4,500 metal panels which form a moving parabola shape in real time. The cabin containing the feed antenna, suspended on cables above the dish, can move automatically by using winches to steer the instrument to receive signals from different directions. It observes at wavelengths of 10 cm to 4.3 m.

Wow... a **mechanically dynamic** array antenna (on a *massive* scale)! I think that's a first (at least, I've never read of an equivalent antenna).

In my opinion, it was a tragedy for science and technology for humanity, and incredible short-sightedness (financially, and for scientific research, and for US science capability) that the US National Science Foundation allowed the [Arecibo Observatory](#) to deteriorate to the point of failure³. The loss of capabilities of Arecibo is a significant loss for US-based radio astronomy (and the occasional use for Amateur Radio).

But *great for humanity and science* that China has created this amazing capability! Perhaps China will want to increase interest Amateur Radio (and interest in radio technology, both China and worldwide) by “activating” the **Five-Hundred-Meter Aperture Spherical Telescope** for occasional [Amateur Radio EME](#) events.

Silent Keyboard - Jeff Mein KP3FT

[KP3FT's obituary](#) was the first I've ever seen where involvement with Amateur Radio data communications was specifically mentioned:

Jeff was much more than a skilled operator; he was a visionary in his field. As a founding member of TPRFN, his influence is woven into the very fabric of the network. He was the creator of the “TPRFN” acronym-a name that now represents a growing community of operators dedicated to resilient, RF-based communication. His extensive knowledge of Packet Radio and his technical expertise were matched only by his willingness to help others. Throughout Central New York and far beyond, Jeff continually pushed the boundaries of what the hobby could achieve, always eager to mentor and support fellow operators. Jeff was also a member of the PR Digital Operators Group (PR DOG) out of Puerto Rico, where he worked alongside others as part of TPRFN to help ensure the island would never again experience the communication blackout devastation that followed Hurricane Maria. In addition, he was a member of the Eastnet Packet Radio Group.

This was especially poignant:

His “signal” will be greatly missed, but his legacy will continue to live on through every packet sent across the network he helped build.

[KP3FT's QRZ.com page](#) has a lot of additional detail about his involvement, including more detailed mention of the Puerto Rico Digital Operator Group Services:

Member of the [PRDOGS Packet Network](#) . Check out their website, they have a large packet network spanning the island with many nodes. They are also part of TPRFN (see below for more info).

Our condolences to KP3FT's family and his colleagues on TPRFN, Eastnet Packet Network, and PRDOGS.

*Please direct comments / feedback about **ZR > BEACON** to the [Zero Retries email list with the #ZR0248 hashtag](#).*

Request To Send

By Steve Stroh N8GNJ

Editorial, Commentary, and Occasional Digressions

Updated - [Zero Retries Guide to Amateur Radio HF Data Communications](#)

Added mentions of the HF modes in NinoTNC, Hush new data mode, and VARAtrack as a use case.

Zero Retries Index for 2026 Issues

I've been intending to do this approximately forever, but there was always something more pressing, or more usually, interesting to write about. Today I needed a “global” view of articles I've written in Zero Retries in 2026, and so I just sat down and got 'er done.

[Zero Retries Index 2026](#)

It was reasonably easy and efficient to do this manually in less than one hour for 2026. For previous years with 50-ish issues each, would be a significant time sink. Now that I have a pattern / template, hopefully I can hand off generation of indexes for previous years over to an AI. Or perhaps it's a rote task I can do in the evenings watching video entertainment.

Zero Retries Archive on DLARC Updated

The [Zero Retries newsletter collection on DLARC](#) is now mostly updated for most issues published in 2026. This is an archive of PDF versions of Zero Retries issues.

It won't be up-to-the-latest-issue complete except around the end of the month or beginning of the month when I upload a month's worth of PDF issues to DLARC's Curator Kay Savetz K6KJN.

Could Be Worse... *Could Be Raining*

My favorite movie is [Young Frankenstein](#), and one of my favorite quotes in that movie is the above. Click [here](#) to get the context. Generally... don't jinx things like I did on Wednesday evening by considering this issue "complete". (*I'm not griping... just explaining how much interesting new stuff keeps occurring.*)

I finished writing and proofreading this issue by the end of the day on Wednesday and queued it up for delivery at 15:30 Pacific on Friday as has always been my goal for publication. I dared hope that, for once in a great while, I was ahead of things and Zero Retries would go out as intended, and I could move on to other overdue writing tasks on the remainder of the week, including my presentation for LinuxFest Northwest on Sunday.

But... *could be raining*. When I opened my email on Thursday morning, there were no less than six great suggestions of Zero Retries Interesting items for inclusion in Zero Retries. All of them were relevant enough to merit inclusion in this issue, especially the lead story about MeshCore. I had an urgent article to write on Thursday, thus had to add all the new articles on Friday, which, of course, pushed the publication time a little past 15:30.

The word count of this issue on Wednesday evening was 8925. The final word count just prior to publication is 12517.

Weekends Are For Amateur Radio! LinuxFest Northwest 2026

This weekend is [LinuxFest Northwest 2026](#) at [Bellingham Technical College](#). LFNW is the highlight of the Bellingham techie social calendar. There used to be a few other techie events in the Bellingham area, but they've all faded out. LinuxFest Northwest also faded out, but it was revived with new energy by a team from [Cascade Steam](#) working with Bellingham Technical College to hold this beloved event. I've been attending LFNW literally for decades now. Coming to Bellingham every year for LFNW made us familiar with Bellingham and LFNW and the Bellingham techie community was a minor factor in Tina and my decision to relocate to Bellingham from the Seattle area.

I'll be attending LFNW on Saturday. None of the Saturday presentations leap out at me, but I always manage to pick a few to attend that justify attending LFNW each year. A highlight of every LFNW is hearing John "maddog" Hall speak on... *whatever*. His topic for LFNW 2026:

Sovereignty

maddog travels around the world. More and more in various countries he hears the word “sovereignty”. Sovereignty, like the word “free” (as in Free Software) is often confusing.

Free Software is not just about the FreeDOM to do what you want with your software, but also about YOU having CONTROL of your software, and not some company or other person.

Today most people think of “Sovereignty” as having your data stored in your own country, under your country’s laws. But Sovereignty also means that YOU are the “sovereign”, YOU are the “king” (or queen) of your computer.

This talk will discuss the issues of sovereignty and how, through Free Software, Open Hardware, Open Data and the Internet you can regain control of your computing, and therefore your business and life.

Saturday, 09:30 - 10:00 in HC 108

It’s always a privilege to hear maddog speak - he’s like the beloved, whacky professor of Linux.

On Sunday, I’m doing a presentation:

Open Source and Linux in Amateur Radio

In many ways, Amateur Radio was the original open source community. Schematics and other aspects of amateur (as in non-professional) projects were shared freely. That open source ethos has continued to the present day, made even more impactful with the development of Software Defined Radio such as GNU Radio. The most impactful project for Amateur Radio at the moment is the Linux Handheld Transceiver (LinHT) which runs Linux and GNU Radio - shell into your portable radio!

Target Audience Techies that are curious about radio technology and want to go beyond using unlicensed spectrum.

Sunday, 11:20 - 11:50 in CC 235

I did a similar talk at LFNW in 2024 and I didn’t think it went well (no converts to Amateur Radio that I could tell). At LFNW 2025 I talked to a Linux fan who attended my 2024 presentation, and I told them I didn’t think it had gone well, so I didn’t submit a request to do a presentation. They said “Your talk was *great!* You realize that not only did you fill up every seat in the room, but there were people that wanted to attend but weren’t allowed to (overcrowd the room)?” I was humbled by their enthusiasm, so I’m going to do it again.

Hamvention Ho!

3 weeks until [Hamvention 2026](#)

2026-05-15 thru 17 in Xenia, Ohio, USA...

Zero Retries / DLARC booth 1506

in Building 1 / Maxim

Have a great weekend, all of you co-conspirators in Zero Retries Interesting Amateur Radio activities!

*Please direct comments / feedback about **Request To Send** to the [Zero Retries email list with the #ZR0248 hashtag](#).*

Closing Thanks

My ongoing **Thanks** to:

Tina Stroh KD7WSF for, well, *everything!*

Jack Stroh, Late Night Assistant Editor Emeritus

Fiona and Shrekya Stroh, Late Night Assistant Editors In Training

Founding Members who generously support Zero Retries financially:

Founding Member 0000 - Steven Davidson K3FZT (Renewed 2025, *3rd year!*)

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Founding Member 0006 - Todd Willey KQ4FID (Renewed 2025, *3rd year!*)

Founding Member 0007 *and* 0010 - Merik Karman VK1DF / VK2MKZ (Renewed 2025 x2, *3rd year!*)

Founding Member 0008 - Prefers to Remain Anonymous 08 (Renewed 2025, *3rd year!*)

Founding Member 0009 - Prefers to Remain Anonymous 19 (Renewed 2025, *2nd year!*)

Founding Member 0011 - Rick Prelinger W6XBE (Renewed 2025, *2nd year!*)

Founding Member 0012 - Ryan Tolboom N2BP (Renewed 2025, *2nd year!*)

Founding Member 0013 - Newton White N4EWT (Renewed 2026, *2nd year!*)

Founding Member 0014 - Joe Hamelin W7COM (Renewed 2026, *2nd year!*)

Founding Member 0015 - Rich Stocking N7OP (New 2025)

Founding Member 0016 - Prefers to Remain Anonymous 77 (New 2025)

Founding Member 0017 - Phil Karn KA9Q (New 2025)

Founding Member 0018 - Prefers to Remain Anonymous 95 (New 2025)

Founding Member 0019 - Prefers to Remain Anonymous 0108 (New 2025)

Founding Member 0020 - Prefers to Remain Anonymous 110 (New 2025)

Founding Member 0021 - Prefers to Remain Anonymous 111 (New 2025)

Founding Member 0022 - Prefers to Remain Anonymous 112 (New 2025)

Founding Member 0023 - Prefers to Remain Anonymous 116 (New 2026)

Founding Member 0024 - Rob Bowser (SPOOLTENNA) (New 2026)

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Zero Retries 0248 was published on 2026-04-24. This issue was 12517 words.

Footnotes For This Issue

To see the relevant sentence for the footnote, just click the footnote number.

[1](#)

I saw at least one reference / plaint that the zBitx software from HF Signals is “still 32 bit”.

[2](#)

xOTA - Summits On The Air, Parks on the Air, Whatever on the Air...

[3](#)

There were **numerous** warning signs of impending failure of the Arecibo radio telescope, which were not acted upon.